REMARKS

Status of case

Claims 1-15 are currently pending in this case.

Objection to Replacement Sheet for Figure 4

Though not mentioned in the present Office Action, the Examiner requested Applicants provide support in the specification for the resistors included in Replacement Sheet for Figure 4. As a general matter, in order to generate reference voltages, it is common to use voltage dividing resistors. For example, original Figure 4 shows dividing resistors being used for V_{ref1} in the overload determination circuit 74. Similarly, voltage dividing resistors may be used for V_{ref2}. If the resistors are not inserted, the ground and positive power supply lines are shorted, which is contradictory to the circuit. Therefore, the application as filed contains disclosure so that one skilled in the art would understand that voltage dividing resistors may be used.

Rejection under 35 U.S.C. §§112

Claims 12 and 13 were rejected under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. The Office Action states that the phrases in Claim 12 "for holding the first switch element in an on-state when a stating switch is turned on" and "to prevent the control signal supply means from generating the on-control signal irrespective of the first switching element being in the on-state" are indefinite. Further the Office Action states that the phrase "for bypassing a current of the photodiode to extinguish the photodiode irrespective of the first switching transistor being in the on-state" is indefinite. Applicants amend Claims 12 and 13 where deemed appropriate. No new matter is added by amendment.

Rejection under 35 U.S.C. §102

Claims 5 and 9-12 were rejected under 35 U.S.C. §102(b) as being anticipated by Shoji et al. (U.S. Patent No. 4,604,006). The Shoji reference teaches a drilling machine that includes a self-operated control function by sequentially detecting a load exerted on a driving motor for an electric drill. Col. 1, lines 10-14. Specifically, Shoji et al. teach a comparator 15 that compares the load value with a reference value. If the load exceeds the first reference value, the controller

16 switches off the power. Col. 4, lines 7-19. Further, after switching off the power, Shoji et al. teach that the comparator 15 compares the load with the reference value. If the load decreases below the reference value, the power switch is immediately turned back on. See id.; see also Figure 3. Therefore, if an operator in Shoji does not notice the alarm and continues drilling, the drill motor may again be in an overload condition when the current is re-supplied to the motor immediately after the determination – potentially repeating the drive-and-stop of the drill motor in a short cycle. Accordingly, a relatively large average amount of current is supplied to the drill motor intermittently in the short cycle, resulting in breakdown of the motor.

In contrast to the Shoji reference, one aspect of the present invention claims a "control unit [that] turns on the main switching element after waiting at least a predetermined time after" determining "that the load current decreases to be smaller than the first reference value . . . ." Waiting at least a predetermined amount of time improves operation of the drilling machine for several reasons. First, an operator of the drilling machine may more easily recognize an overload condition of the drill motor by the motor stopping for the relatively long time duration (due to the waiting of at least a predetermined time), and thus can control to weaken his force in an advance direction of a cutter. Second, even if the operator does not recognize the overload condition and continues the operation of the drill, waiting at least a predetermined amount of time before turning on the motor may extend the life of the motor. Specifically, waiting results in a relatively small average amount of a motor current (as opposed to not waiting before re-turning on the motor). It is thus possible to keep the average amount of the motor current within a tolerance range by adjusting the motor stop duration. Therefore, breakdown of the motor is less likely to occur, and certainly less likely that the drilling machine taught in the Shoji reference (which does not wait a predetermined amount of time). Therefore, Claims 5 and 9-12 are patentable over the Shoji reference.

Rejection under 35 U.S.C. §103

Claims 1, 3, and 4 were rejected under 35 U.S.C. §103(a) as being unpatentable over Gill (U.S. Patent No. 6,280,123) in view of Omi et al. (U.S. Patent No. 5,988,956). Claim 2 was rejected under 35 U.S.C. §103(a) as being unpatentable over Gill in view of Shoji et al. Claims 6 and 7 were rejected under 35 U.S.C. §103(a) as being unpatentable over Shoji et al. in view of Gill.

The Gill reference teaches a drill having an annular cutter (or cutting tool), as shown in Figs. 7-9 thereof. The cutter in Gill is made of a high-speed steel and the angles of the cutter are adapted to accommodate the reduced power, speed, and torque of a smaller drill and magnetic base. See Figs. 7-9; see also col. 5, lines 26-32. As acknowledged in the Office Action, the Gill reference does not teach, or even suggest, using an annular cutter having a plurality of carbide tips. Thus, the cutter in Gill is adapted to drill a metallic plate at a low rotational speed.

The Omi reference describes a drill which includes an annular cutter having a plurality of carbide tips. However, the Omi reference fails to teach, or even suggest, using the annular cutter at a reduced rotational speed of a drill.

In contrast, another aspect of the present invention claims an electric drill having "an annular cutter for cutting at a high rotational speed, and having a plurality of cutting blades comprised of cemented carbide tips fixed on its lower end". As described in the specification, the annular cutter, which includes a plurality of cutting blades each comprised of a cemented carbide tip, allows for the rotational speed of the cutter to be increased. Specification, pg. 13, line 28 - pg. 14, line 24. For instance, the rotational speed may be about four times higher than the rotational speed disclosed in the prior art. Since the rotational speed of the cutter can be set to be relatively higher in the present invention, a drill motor that can rotate at a high rotational speed can be employed, resulting in reduction of size and weight of a drill apparatus.

By utilizing the high rotational speed motor adapted to the annular cutter having the cemented carbide tips, the cutting resistance can be reduced, as compared with a high-speed steel annular cutter (disclosed in Gill) for a rotation at a low speed. This is because, assuming that a torque is constant, the larger a rotational speed is, the smaller cutting force is and hence the smaller cutting resistance is. Due to the smaller resistance force, the sizes and weights of a rotation reduction mechanism and an adhesion base of the drill apparatus can be reduced, which may result in reduction of the size and weight of the whole drill apparatus.

In particular, since the rotational speed of the motor is high, the torque of the motor can be low. Therefore, strength of a rotation transmission mechanism of the rotation reduction apparatus can be reduced (as well as the size and weight of the rotation transmission mechanism). Further, since the cutting force is smaller, adhesive force of the adhesion base can be reduced, thereby reducing the size and weight of the base. In a drill apparatus, the adhesion base occupies a relatively large space and weight in the apparatus. Therefore, reducing the

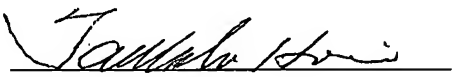
adhesion base in size and weight serves to reduce the size and weight of the whole drill apparatus. In addition to the above, since the cutting resistance force can be lowered in the present invention as stated above, the force for advancing and retracting the cutter by a manual handle can be lowered, so that an operator can more easily manipulate the handle.

Applicants respectfully disagree that the Omi and Gill references render the claims obvious. As an initial matter, the Omi reference is not properly combined with the Gill reference. The Gill reference is directed to a steel cutter operating at a lower rotational speed. In contrast, the Omi reference is directed to a cutter with carbide tips. One skilled in the art would not be motivated to combine the references, given that the Gill reference intends to accommodate a reduced rotational speed of a drill. Further, even if the Omi and Gill references were combined, the combination would not teach the invention. The Gill reference teaches operating at a lower rotational speed so that, even if combined with the Omi reference, would not teach the high rotational speed limitation of claim 1. Therefore, the claims are patentable over the cited references.

Summary

Applicants submit that based on the foregoing remarks, the rejections have been traversed, and that the claims are in condition for allowance. Should there be any remaining formalities, the Examiner is invited to contact the undersigned attorneys for the Applicants via telephone if such communication would expedite this application.

Respectfully submitted,



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